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(Illustrated articles are marked with an asterisk.)

THE NEW ADMINISTRATION.

The inauguration of President Grant marks a turning point in the history and policy of the Government, and the people have abundant reason to feel confident that the new administration will speedily commence reforms which shall not end until the public service is purified of those corruptions and villainies which disgraced the last administration.

The appointment of Alex. T. Stewart, of this city, to the responsible office of Secretary of the Treasury means business. The most successful merchant of his time—his vast wealth places him beyond the possibility of temptation, and if he had no higher motive to guide his action, Mr. Stewart's social position and wealth are sufficient guarantees that he will endeavor to administer the affairs of the Treasury in an honest and economical manner. The revenue service, at the present moment, is filled with a set of sharks who are cheating the Government and robbing the people of their hard-earned substance.

We undertake to say, that, if Secretary Stewart takes as good care of the public treasury as he does of his own private affairs, he can save $50,000,000 every year, and to that extent lighten the burdens of the tax payers. Secretary Stewart cannot afford to do wrong—he has every incentive to do right and to give us a class of honest men in positions now held by swindlers and thieves. We venture the prediction that the business of the Treasury Department will be very much improved in its character and efficiency.

The appointment of Ex-Governor Cox, of Ohio, to the position of Secretary of the Interior, is eminently a good one. Under his administration, we shall expect to have no more Dempsey & O'Toole contracts in the Patent Office; and we cherish the belief that the new Secretary will give earnest consideration to the pressing affairs of that bureau.

The service of the Patent Office is now inadequate to the demands of inventors. Some of the employés are notoriously inefficient, and ought to be removed; and the Commissioner needs to have his hands strengthened by an energetic and able corps of examiners. There is work enough for all the new Secretaries to do, and President Grant has shown his practical good sense in selecting men who are untrammeled by strict party rules; in other words, while they are pronounced adherents to the political creed of the successful party, they come to their new duties pledged to no class of greedy spoil-seekers, but are free to do honest, fearless work for the country, irrespective of partisan selfishness. The politicians, it is said, growl; but the people, who make parties, are heartily sick of the corrupt rings which, for four years, have made our public service a scandal to the nation. We go for solid reforms, and for an honest collection and application of the public revenues

THE SUM OF ALL THE MOTIONS IN THE UNIVERSE.

Motion is a constant quantity; "The sum of all the motions in the universe is always the same." This sentence placed at the foot of a column in a recent issue of our paper, has attracted the attention of a correspondent, who, while admitting its truth, says he finds it "hard to solve all the perplexing problems that grow out of such an admission. For instance, suppose a terrible conflagration to take place at midnight. Thousands of persons awake from sleep and rush to the fire. Where so many are rushing, in what form would that motion have been manifested, if there had been no fire and the people had remained in bed?"

The doctrine of the perpetuity and indestructibility of motion involves the truth that all motions originate, or are increased by subtractions from other pre-existing motions, or cease, or become diminished, only by imparting motion.

The difficulty in accounting for the origin of a new motion, arises chiefly from not clearly comprehending the distinction between mass motion and molecular motion. In the motion of a mass, the relative position of its geometrical center is constantly changed. Molecular motion may exist in a body without any relative change in the position of its geometrical center. When mass motion suddenly appears, without being immediately caused by other mass motion, it results from the immediate conversion of molecular motion.

Of all the molecular motions heat is the one most concerned in the direct production of mass motion. The case suggested by our correspondent, of people suddenly aroused from sleep into action, is analogous to that of a locomotive standing in a depot with steam up, and then suddenly, by the simple act of the engineer, expending the power confined in the boiler in the propulsion of itself and its load. All the motion that it and the train it draws possess after starting, existed previously in the form of heat in the furnace and boiler, and molecular motions of the coal in the tender and oxygen in the atmosphere, which, when chemical combination (combustion) takes place between these elements, are converted into heat, which in its turn is converted into mass motion.

Men and animals are locomotives. Their food is the fuel which drives them; their wills are the engineers which control them. The fuel (food), which is put into their furnaces (stomachs), is however applied to two purposes. Part is expended in warming the machine and part is stored up in the various tissues of the body, to be consumed either for warmth or motion, as occasion may require. But because it is thus stored up, it must not be inferred that motion does not exist in it. It may or may not possess mass motion, according to the state of action or repose in which the animal chances to be; but in all cases where mass motion of a living body exists, as an act of the will, consumption of tissue also takes place, that is, a change of molecular motion into mass motion. After the crowd have rushed to the fire and rushed back again, their aggregate weight will have been considerably reduced, and they will find it necessary to "coal up" next morning at breakfast to make up for the loss.

Thus we see that in the case cited there is no difficulty in referring the mass motion, suddenly resulting from the interposition of will, to previously existing molecular motion. In all other cases, although in some the connection between a mass motion and pre-existent molecular motions may be difficult to trace, there can be no reasonable doubt of its existence; and in the light of modern science it is certain that the sum of all the motions in the universe is a constant quantity.

SOLUTION.

Every one is familiar with the phenomenon of solution, but few except scientific men really know what a remarkable thing it is. We toss a handful of common salt into some water; in a little while it has entirely disappeared. So far as our sight can determine it has ceased to exist. We can still detect its presence by taste, and by its effects upon other bodies, but until, by the aid of heat or some chemical reagent, we wrench it from the strong grasp of its transparent menstrum we cease to see it.

So alcohol absorbs into itself camphor, and other gums or oils, and retains them. Add a little water to these solutions and you will immediately see the dissolved substances reappear like spectres, to again vanish upon the addition of more alcohol.

The analytical chemist knows well how to make such appearances and disappearances answer his inquiries, both as to quality and quantity, of any substance contained in a given mass which he examines. In fact the deportment of substances in solutions in the presence of certain reagents forms the basis of one method of analysis.

One of the most conspicuous characteristics of a solution is transparency. This is a test as to whether a solid contained in a fluid is perfectly dissolved. Very concentrated solutions may intercept to a great degree the transmission of light molasses is an example; but if the solution be perfect, thin layers will prove to be transparent. Any opacity or cloudiness is an index that either solid or vesicular matter is present. Solid substances when dissolved are changed into fluids. What is the agent by which the intense cohesion existing between the atoms of the most solid bodies can be so overcome? To this question science has, we think, yet given no satisfactory answer.

The only means known to us other than solution by which solid bodies can be made fluid is heat. It is a well ascertained fact that heat and cohesion are opposing forces, but in the phenomenon of solution sensible heat does not appear except in such quantity as may be accounted for by the increased density of the entire mass of the solvent and the substance dissolved. In cases where solids placed in contact become liquefied we have decrease of temperature and absorption of heat; an example of this kind of action is the liquefaction of mixed ice and salt.

The books account for the phenomenon of solution by classing it among the manifestations of adhesive force. Cohesion is the attraction existing between molecules of the same kind at insensible distances; adhesion is the attraction existing between molecules of *different* kinds at insensible distances. A very slight consideration of the nature of these attractive forces, and their effects upon the condition of material bodies, will show that solution involves something more than disruption of the particles of a solid by the superior adhesive force of a liquid.

A solid body is *solid* by virtue of the great cohesive force by which its particles are held together. When cohesive attraction is nearly or quite in equilibrium with repulsive molecular force, bodies assume the liquid form. Liquids may therefore be considered as practically without cohesive attraction, that attraction being neutralized by repulsion. Suppose now the cohesive force in a solid body to be represented by 4, the superior adhesive attraction of some liquid for that solid to be 6, and the cohesive force in the liquid as neutralized by the repulsive force to be nothing. What ought to take place upon the immersion of the solid into the liquid as the result of cohesion and adhesion? The particles of the liquid adjacent to the solid ought to adhere to the solid so strongly that they could not be removed by an external force without rupturing the solid. If either body be acted upon by an external force, the rupture ought to take place in that body having the least cohesive power, *i. e.*, the liquid. A stick thrust into treacle is a good illustration of this action. When the stick is withdrawn it carries a portion of the treacle with it; the stick is not broken nor any of its particles removed.

But it may be said in this case the cohesive force acting between the particles of the wood is greater than the adhesive force of the treacle. Let us then suppose the adhesion of the treacle to the wood to be so powerful that the treacle can not be removed from the stick except by scraping down into the body of the wood itself. If solution depends solely upon the fact that adhesion in the liquid is greater that cohesion in the solid, the stick ought in this case to dissolve. But in order that a substance may dissolve, its particles must not only be seized upon by the particles of the solvent but conveyed away from their position in the solid to new positions in the liquid. We submit that adhesion accounts sufficiently for the seizure but it does not account for the convection. Standing in a boat by the side of a wharf, a man may clutch a timber attached to the wharf with great force; he may, however, tug in vain to remove it, so long as the want of cohesion in the water upon which his boat is floating affords a resistance less than that which holds the timber to its place.

There must be some other principle involved in this matter. Something perhaps analogous to electrical attraction and repulsion, at least some force acting independently of adhesion which overcomes the cohesion of the solid.

DROWSINESS AND REMEDIES FOR IT.

A correspondent writes us that the excellent article on "Wakefulness," recently published in the SCIENTIFIC AMERICAN, does not meet his case, which he states is a common one with laboring men. His affliction is drowsiness. He says within the narrow circle of his acquaintance there are not less than three-fourths who are afflicted in the same way. This affection is a standing obstacle in the way of self-improvement; and our correspondent complains that his own acquisitions have been greatly limited on account of it, and desires to know what may be done to remedy the evil.

We are well aware that drowsiness is a much more common complaint than wakefulness, and, in general, it is one, which, owing to the difficulty of inducing people to renounce long established habits, is hard to cure.

The phenomenon of sleep is yet enveloped in profound mystery. Volumes have been written upon it; numberless experiments have been performed; and after all we know nothing whatever of its true character. Experiment has taught us, however, that drugs produce it when taken into the stomach, or otherwise conveyed into the system; that certain habits produce a greater desire for it than is natural; and that the will has power to resist its demands to a limited extent.

The causes of sleep are then either natural, or unnatural, and the phenomenon is correspondingly morbid or healthy. The natural and healthy sleep, consequent upon exhaustion, can never be interfered with without greater or less damage to the general health in each instance. Unnatural drowsiness generally results from some error in the habits of living, or it is a constitutional defect. The latter is difficult to cure, but the majority of cases are not constitutional affections, and they are curable.

Many cases of supposed abnormal drowsiness, are not abnormal at all. People who work hard all day, or who have been exposed to cold winds, are apt to feel sleepy when they find themselves comfortably housed in the evening, especially if they have indulged in a *hearty supper*. All these causes naturally induce sleep, and when the tendency to sleep is powerful it ought not to be resisted. Many will find the disposition to sleep postponed for several hours, by the substitution of a very light meal for the hearty one which is often taken at the close of the day's work. Others will find that this does not avail them, and that notwithstanding their abstemiousness, the drowsy god still asserts his sway. These people will have to submit, and either doze in their easy chairs or go to bed; but they need not on that account be deprived of time for study. They will almost invariably find that they can rise two or three hours earlier than other people, without inconvenience, and they will further find that their three morning hours *before breakfast* are as good as four in the evening *after supper* would be if they could keep awake and study. They may, at first, find some difficulty in waking at the proper time; an alarm clock will overcome that. They should not, at first, apply themselves to reading or study in these reclaimed morning hours, but should engage in some active occupation until the habit of thoroughly waking is established, after which in the majority of cases no inconvenience will be experienced.

A feeling of drowsiness after eating is perfectly natural and healthy, but it is easy to see that over-eating might so intensify the feeling as to render it nearly impossible to resist it. Those troubled with this complaint, ought then to carefully